

REMARKS

Claim 1 has been amended to clarify that the surface of the moulding is subjected to a free radical initiator before coating and that after the polymer has been precipitated to the surface it is bonded via an initiator. Support for the amendment can be found, for example, in the specification on page 10, 1st paragraph and on page 11, 2nd paragraph. No new matter has been added.

Rejections under 35 USC §112

Claims 1-5, 12-20 and 22-25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Examiner states that it is unclear what is meant by "the pores are retained after coating". A skilled worker would easily understand that the porous nature of the molding is retained after coating (i.e., the pores are not blocked but the surfaces of the pores are coated). The pores still facilitate flow through even after coating. See, page 5, lines 16-19 of the specification.

Thus, it is respectfully requested that the rejection under 35 USC §112 be withdrawn.

Rejections under 35 USC §102/103

Claims 1, 2, 4, 5, 14, 16, 17, 19, and 25 stand rejected under 35 U.S.C. 102(b) as allegedly being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over EP 838 257. Claims 3, 15, and 18 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over EP 838 257, and further in view of WO 98/58253. Claims 12 and 13 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over EP 838 257, and further in view of Dhingra et al (US 6,054,052). Claim 20 stands rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over EP 838 257, and further in view of Li et al (US 7,125,488). Claims 22 and 23

stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over EP 838 257, and further in view of Ohno et al (US 4,483,940). The rejections are respectfully traversed.

The process conditions of the present invention affect the distribution of the coating material on the inner surfaces of the moulding of the present invention. The inner pores of the moulding are uniformly coated while the porosity of the moulding is retained (i.e., the pores are not blocked). The more pore surface area that is coated with polymer the less support material is exposed to NaOH attack. A moulding whose surfaces are first treated with a free radical initiator and then treated with a prepolymer coating solution that is precipitated by lowering the temperature, is not only very dense but is also very stable against NaOH. This advantage is demonstrated by the Examples in the specification. The mouldings of the present invention exhibit distinct physical differences from the prior art mouldings. Example 3 shows in-situ polymerization, wherein the initiator is adsorbed at the inner surfaces in a first step and in the following step the polymerization step takes place at the inner surface of the monolithic body. Thus, the inner surface of the moldings according to the present invention exhibits a very dense coating as can be visualized in Figs. 2 A and B. These scanning electron microscope pictures show there is no difference between the coated and uncoated mouldings with respect to morphology but as discussed in Example 1.5, the macropore structure is maintained and a dense uniform coating of pore surfaces is achieved. As disclosed in the specification (Example 2) at page 17, line 24 to page 18, line 16, for example, this dense coating is achieved by the introduction of the coating solution into the monolithic material by a decrease of temperature. The decrease of temperature induces a precipitation onto the moulding under suitable conditions. The details of this coating are described on pages 9 -11 of the present application. The dense precipitated coating exhibits exceptional stability against alkaline attack. See Example 1, for example, which compares the properties of a C-18 functionalized moulding with a polymer coated moulding according to the invention. Table 1, shows the remaining carbon content of the mouldings and their condition after treatment with sodium

hydroxide solution for various times. As can be seen the C-18 functionalized mouldings lose a considerable amount of weight and thus also carbon modification in sodium hydroxide solution and are in some cases destroyed or even completely dissolved. By contrast, the polymer coated samples according to the invention which have a uniform coating on the inner pore surfaces exhibit good stability to the sodium hydroxide solution. Clearly, the stability of a moulding to sodium hydroxide depends on the density and uniformity of the polymer coating. Thus, there are significant unobvious differences between the claimed products, in which the inner pores of the moulding are coated and the prior art products.

On page 7 of the Office Action the Examiner states:

" It appears that EP'257 uses the same material forming a coating as Applicants, therefore it is not seen that the coating could not be stable against NaOH, as like material has like property."

A significant difference between the product disclosed in EP 0 838 257 (Dell et al.) and the present invention is the fact that in the present invention the polymerization reaction takes place inside the monolithic column in the presence of the solvent as described in detail on page 8 of the specification. This method ensures that the inner pores are not clogged and are uniformly coated with a thin layer of polymer, which is built on-site. This in-situ polymerization method, as demonstrated by the Examples and discussed above results in a moulding that is not only very dense but is also is stable against NaOH. See Figures 2a and 2b of the specification and Example 1.5 and 3. Thus, even if the coating material is the same, as the Examiner alleges, the process steps of the present invention result in inner pores coated with a thin layer of polymer thereby creating a moulding that is stable against NaOH.

In contrast to this, in EP 0 838 257 (Dell) a polymer membrane film is applied to the inner surfaces of the moulding under pressure and in a softened state. The film is applied by hot pressing, tape casting, injection molding or extrusion. The membrane

material does not permeate into the inner mesopores (See column 4, line 56 - column 5, line 7). The membrane coating of Dell does not build a dense uniform layer on the inner pore surfaces of the mouldings and the porous structure of the monolithic moulding doesn't remain. This method is entirely different in comparison to the present invention and cannot lead to the same result because of the viscosity of the softened polymers, which must be forced into the pores of the shaped body without clogging the pores. The moulding of the present invention is not comparable to that disclosed in EP 0 838 257. Thus, Applicants have shown that the process limitations of the present invention produce a product that is clearly distinct.

Likewise the moulding of US 6,398, 962 (Cabrerria et al- equivalent to WO98/58253) does not have a polymer layer that is inert against the action of NaOH and is not comparable to the moulding of present invention. US 6,398,962 enables the separation of enantiomeric mixtures by modifying the inner surfaces of the monolithic column which leads to effective groups at the inner pore surfaces.

As discussed above and throughout the specification, a moulding whose inner surfaces are first treated with a free radical initiator and then treated with a coating solution that is precipitated by lowering the temperature, is not only very dense but is also stable against NaOH. Such a coating will not block macropore structures but will coat inner pore surfaces. The resulting moulding exhibits distinct physical differences from the prior art mouldings. Thus, there are significant unobvious physical differences between the claimed product and the prior art products.

Moreover, neither Dell nor '962 teach or suggest a moulding having one side longer than the other(s) and having a cladding on the long side.

The secondary references do not cure the deficiencies of the primary references discussed above.

Ohno et al (US 4,483,940) teaches a ceramic honeycomb carrier of monolithic construction that is coated with 2-hydroxyethyl methacrylate. See column 4, lines

10-20. Like, Dell and Cabrera discussed above, Ohno is silent regarding a moulding whose inner surfaces are first treated with a free radical initiator and then treated with a coating solution comprising at least one organic prepolymer or organic monomer and/or oligomer that is precipitated by lowering the temperature which results in a distinct dense coating on the inner pore surfaces that is resistant to alkaline attack.

Dhingra et al (US 6,054,052) is relied upon for teaching a porous inorganic sorbent in the form of a flat membrane having a thickness 0.02 to 1000 microns.

Li et al (US 7,125,488) is relied upon for teaching a silica monolith having a surface modified with at least two silanes wherein one silane is an endcapping silane.

Dhingra and Li are both silent regarding a solution comprising at least one organic prepolymer or organic monomer and/or oligomer, which is precipitated from the coating solution by lowering the temperature.

B) Claims 1, 2, 4, 5, 12, 16-17, 19, and 21-25 stand rejected under 35 U.S.C. 102(b) as allegedly being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Stanton et al (US 4,851,163). Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Stanton et al (US 4,851,163) as applied to claim 1, and further in view of Johnson (US 2002/0041041). The rejections are respectfully traversed.

Stanton (US 4,851,163) discloses a porous ceramic diffuser for wastewater treatment made from a porous ceramic body coated with a biocidal material to protect against fouling (column2, lines 30-37). The biocidal material is sprayed or brushed on and chemically or physically bonded in a shallow layer extending inwardly from the exposed surface (column 2, lines 20-30). The porous ceramic body may be silica (column 3, lines 20-25). The coating may be a polymethacrylate (example 1).

On page 9 of the Office Action the Examiner states:

" It appears that Stanton uses the same material for coating as Applicants, therefore it is not seen that the coating could not be stable against NaOH, as like material has like

property."

As the Examiner correctly notes, Stanton does not specifically disclose the processing steps as set forth in the claims. In contrast to the present invention, after coating, the treated article of Stanton is heated to a temperature at which the biocidal copper oxide diffuses into the surface of the treated article. Thus, the treatment leads only to a diffusion of the material onto the surface grains resulting in a very thin layer on the exposed upper surface. The method of Stanton would not result in coating penetration deeply into the inner pores of the treated material. See, for example, the description of Figures 1 and 2 at column 3 lines 7 - 48. Figure 2 depicts a small region at the particle surface (the pore boundary 20). Additionally, column 4, lines 19 to 25, states:

"Organic biocidal ceramic composite bodies were also fabricated by spraying or brushing a mixture of organic polymer containing a biocidal component on the surface and then allowing the polymer to cure which chemically bonds or grafts the polymer coating to the surfaces of the grains in a manner similar to that shown with the copper coating. "

This, it is clear that Stanton only treats surfaces of the grains in order to achieve the antifouling effect. Stanton doesn't teach or suggest anything that would lead a skilled worker to introduce a polymer coating into the inner pores of a porous body.

On page 11 of the Office Action the Examiner points to Col, 2, lines 25-30 of Stanton to show that the biocidal material penetrates into the pores.

" ...having a microscopic layer of biocidal material physically or chemically bonded in a shallow layer extending inwardly from the exposed surface. The microscopic layer of biocidal material is bonded only to the exposed particles which define the boundries of the pores in the shallow layer".

The Examiner is defining the pore as the space between the ceramic particles. Regardless, of how the pore is defined the biocidal material is only bonded in a shallow layer extending inwardly from the exposed surface. At col. 3, lines 40-44 the shallow layer is less than 1 mm. The teaching of Stanton would lead to a body, which is

covered at the outer exposed surface by polymers but not to a body whose inner body surfaces are protected by a uniform polymer layer against NaOH attack. This is achieved because an inorganic moulding whose inner surfaces are first treated with a free radical initiator and then coated with a coating solution comprising at least one organic prepolymer or organic monomer and/or oligomer that is precipitated from the coating solution by lowering the temperature, results in a moulding whose inner pores are protected by a uniform polymer layer against NaOH attack.

Thus, even if Stanton used the same coating material as the present invention the inner pores of Stanton's porous ceramic body would not be protected and would be susceptible to NaOH attack. There are clear unobvious differences between the present invention and the prior art product.

Johnson does not cure the deficiencies of Stanton. Johnson (US 2002/0041041) is relied upon for teaching a hollow monolithic ceramic diffuser having a length of from 50 to 762 mm and a width of from 6 to 90 mm.

All of the cited references are all silent with regards to a moulding whose inner surfaces are first treated with a free radical initiator and then treated with a prepolymer coating solution that is precipitated by lowering the temperature. Such a coating process results in a moulding having uniformly coated inner pores. The resulting moulding is not only very dense but is also stable against NaOH and exhibits distinct physical differences from the prior art mouldings (e.g., uniformly coated inner pores). Thus, it is respectfully requested that the rejections under 35 USC §102 and §103 be withdrawn.

No fee is believed to be due with this response, however, the Commissioner is hereby authorized to charge any fees associated with this response or credit any overpayment to Deposit Account No. 13-3402.

Respectfully submitted,

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